

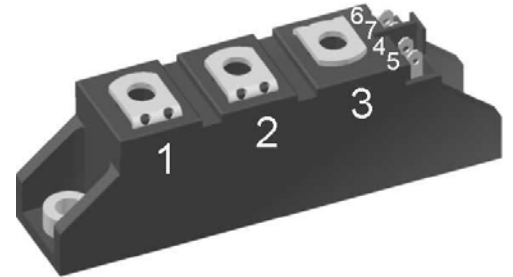
Thyristor Module

 $V_{RRM} = 2 \times 800V$
 $I_{TAV} = 18A$
 $V_T = 1.57V$

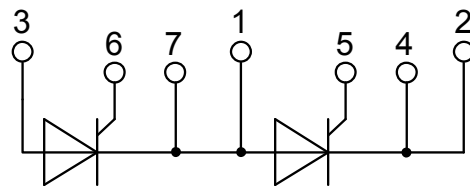
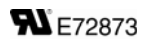
Phase leg

Part number

MCC19-08io1B



Backside: isolated



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al₂O₃-ceramic

Applications:

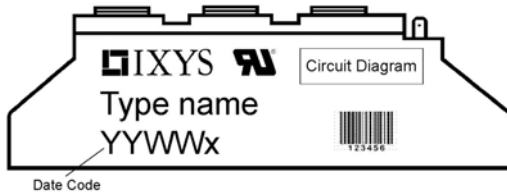
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: TO-240AA

- Isolation Voltage: 3600V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

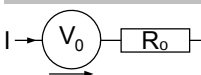
Thyristor				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$			900	V	
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$			800	V	
I_{RD}	reverse current, drain current	$V_{RD} = 800\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		100	μA	
		$V_{RD} = 800\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$		3	mA	
V_T	forward voltage drop	$I_T = 40\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$		1.56	V	
					2.05	V	
		$I_T = 40\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$		1.57	V	
					2.29	V	
I_{TAV}	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 125^{\circ}\text{C}$		18	A	
$I_{T(RMS)}$	RMS forward current	180° sine			40	A	
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 125^{\circ}\text{C}$		0.85	V	
r_T	slope resistance				18	m Ω	
R_{thJC}	thermal resistance junction to case				1.3	K/W	
R_{thCH}	thermal resistance case to heatsink			0.20		K/W	
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$		77	W	
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$	$V_R = 0\text{ V}$	400	A	
					$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	430	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$	$V_R = 0\text{ V}$	340	A	
					$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	365	A
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$	$V_R = 0\text{ V}$	800	A ² s	
					$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	770	A ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$	$V_R = 0\text{ V}$	580	A ² s	
					$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	555	A ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		22	pF	
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 125^{\circ}\text{C}$		10	W	
		$t_p = 300\text{ }\mu\text{s}$			5	W	
P_{GAV}	average gate power dissipation				0.5	W	
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125^{\circ}\text{C}; f = 50\text{ Hz}$	repetitive, $I_T = 45\text{ A}$		150	A/ μs	
				$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.45\text{ A}/\mu\text{s};$			
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$	$R_{GK} = \infty$; method 1 (linear voltage rise)		1000	V/ μs
					$I_G = 0.45\text{ A}; V_D = \frac{2}{3} V_{DRM}$		500
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		1.5	V	
			$T_{VJ} = -40^{\circ}\text{C}$		1.6	V	
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		100	mA	
			$T_{VJ} = -40^{\circ}\text{C}$		200	mA	
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$		0.2	V	
I_{GD}	gate non-trigger current				5	mA	
I_L	latching current	$t_p = 10\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$	$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$		450	mA
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$		200	mA	
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$	$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$		2	μs
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 20\text{ A}; V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$		150	μs	
		$di/dt = 10\text{ A}/\mu\text{s}; dv/dt = 20\text{ V}/\mu\text{s}; t_p = 200\text{ }\mu\text{s}$					

Package TO-240AA				Ratings		
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			200	A
T_{stg}	storage temperature		-40		125	°C
T_{VJ}	virtual junction temperature		-40		125	°C
Weight				90		g
M_D	mounting torque		2.5		4	Nm
M_T	terminal torque		2.5		4	Nm
$d_{Spp/App}$	creepage distance on surface striking distance through air	terminal to terminal	13.0	9.7		mm
$d_{Spb/Apb}$		terminal to backside	16.0	16.0		mm
V_{ISOL}	isolation voltage	t = 1 second		3600		V
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3000		V



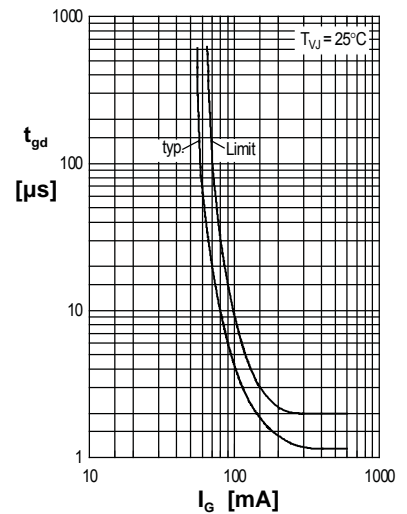
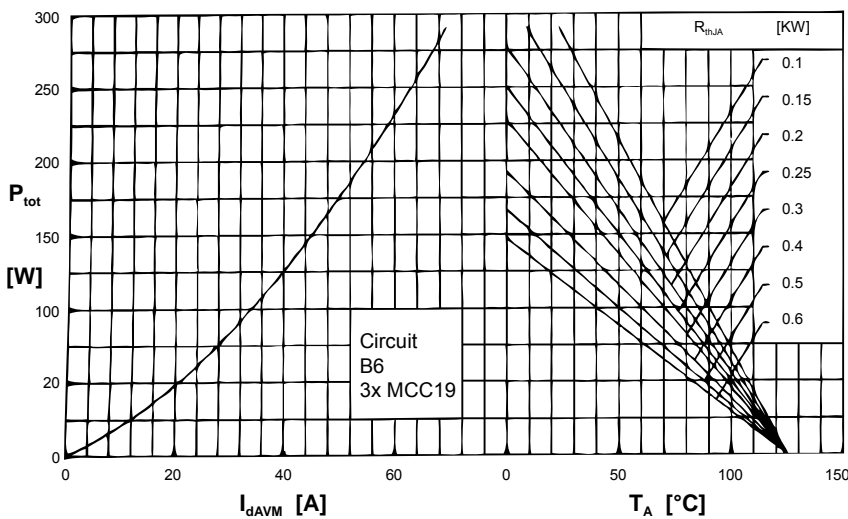
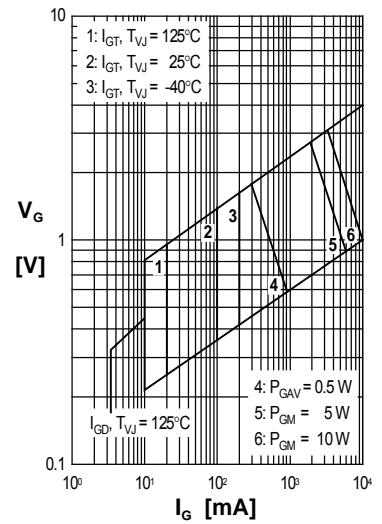
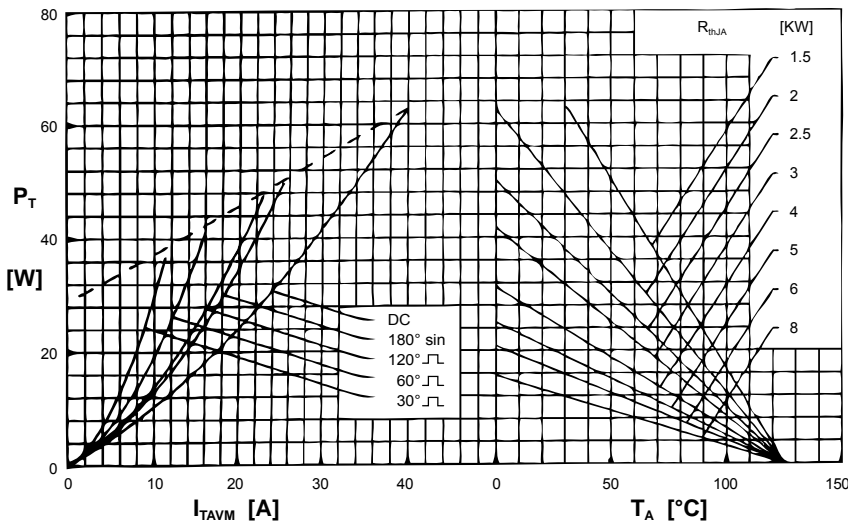
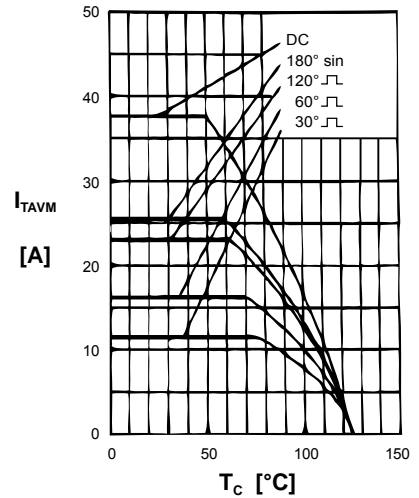
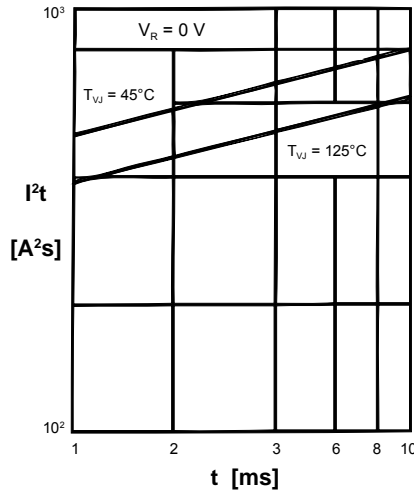
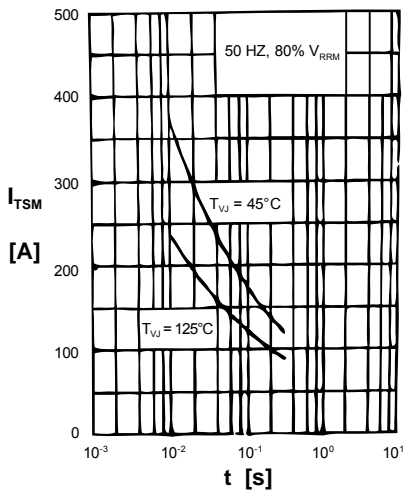
Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC19-08io1B	MCC19-08io1B	Box	6	452807

Similar Part	Package	Voltage class
MCMA25P1200TA	TO-240AA-1B	1200
MCMA35P1200TA	TO-240AA-1B	1200

Equivalent Circuits for Simulation
** on die level*
 $T_{VJ} = 125\text{ °C}$

Thyristor

$V_{0\ max}$	threshold voltage	0.85	V
$R_{0\ max}$	slope resistance *	16.8	mΩ

Thyristor



Thyristor

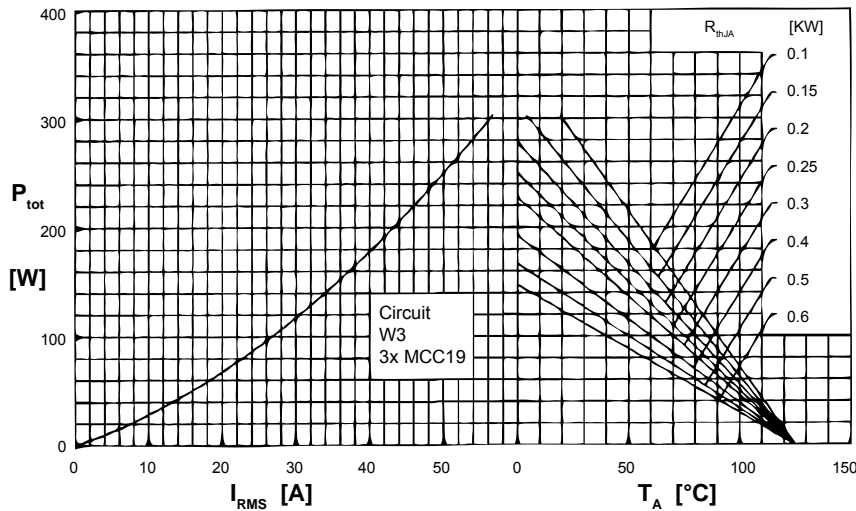
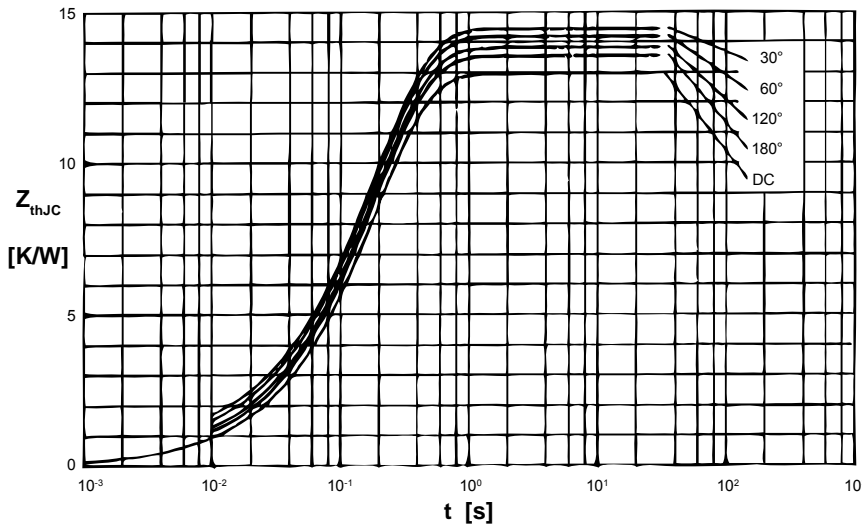


Fig. 7 Three phase AC-controller: Power dissipation vs. RMS output current and ambient temperature



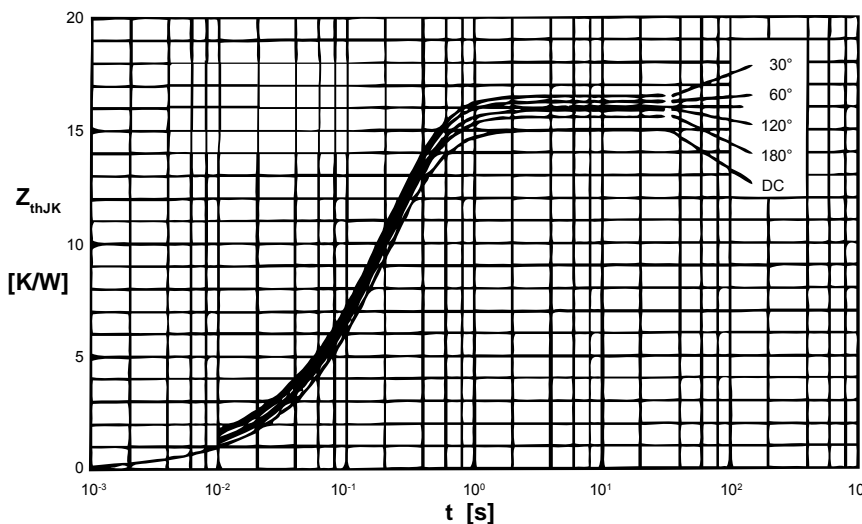
R_{thJC} for various conduction angles d:

d	R_{thJC} [KW]
DC	1.30
180°	1.35
120°	1.39
60°	1.42
30°	1.45

Constants for Z_{thJC} calculation:

i	R_{thi} [KW]	t_i [s]
1	0.018	0.0033
2	0.041	0.0216
3	1.241	0.1910

Fig. 8 Transient thermal impedance junction to case (per thyristor)



R_{thJK} for various conduction angles d:

d	R_{thJK} [KW]
DC	1.50
180°	1.55
120°	1.59
60°	1.62
30°	1.65

Constants for Z_{thJK} calculation:

i	R_{thi} [KW]	t_i [s]
1	0.018	0.0033
2	0.041	0.0216
3	1.241	0.1910
4	0.200	0.4600

Fig. 9 Transient thermal impedance junction to heatsink (per thyristor)